

Title: Hard as a Rock**Brief Overview:**

This unit involves collecting, organizing, displaying, and analyzing data related to rock type properties. Students collect data through a series of standard geological procedures often performed for identification purposes and in the selection of building materials.

Links to Standards:

- **Mathematics as Problem Solving**

Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.

- **Mathematics as Communication**

Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.

- **Mathematics as Reasoning**

Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.

- **Mathematical Connections**

Students will demonstrate their ability to connect mathematics topics within the discipline and with other disciplines.

- **Statistics**

Students will demonstrate their ability to collect, organize, and display data and will interpret information obtained from displays. They will write reports based on statistical information.

Grade/Level:

Grades 4-5

Time/Duration:

3-5 Days (60 minute sessions)

Prerequisite Knowledge:

Students should have working knowledge of the following:

- Collecting, organizing, and displaying data
- Properties of hardness, calcite presence, color and texture of common rocks and minerals and how to test for their presence

Objectives:

Students will:

- work cooperatively with partners and in groups.
- collect, organize, and display data.
- identify rock types -- igneous, metamorphic, sedimentary.
draw and report conclusions based on analysis of rock test data.

Materials/Resources/Printed Materials:

- A set of rock and mineral samples of various origins (per group)
- Graph paper/chart paper
- Pennies, glass microscope slides taped flat on cardboard, large nails (one each per group)
- *Magic School Bus: Into The Earth*
- Tape
- Yarn
- Student Resource 1 (Writing Prompt)
- Teacher Resource 1 (Rubric)
- Teacher Resource 2 (Overhead Organizer)

Development/Procedures:

Prior to Day 1:

- Divide students into cooperative groups of four or five.
- Assign cooperative group jobs -- facilitator, recorder 1, recorder 2, recorder 3, reporter.

Day 1:

- Activate prior knowledge with a discussion of what children think is under the earth's surface (teacher should record information on chart, board or overhead). Query students if anyone knows the three different types of rocks.
- Introduce rock type names (igneous, metamorphic, sedimentary).
- Develop with the class an organizer to record information gained from read aloud (use basic overhead organizer). As a class, students generate the topics to listen for during read aloud.
- Read *Magic School Bus: Into The Earth*. Have a plan to pause after each topic to allow students to glean information in their cooperative groups.
- Complete the organizer with the class. Recap today's lesson.

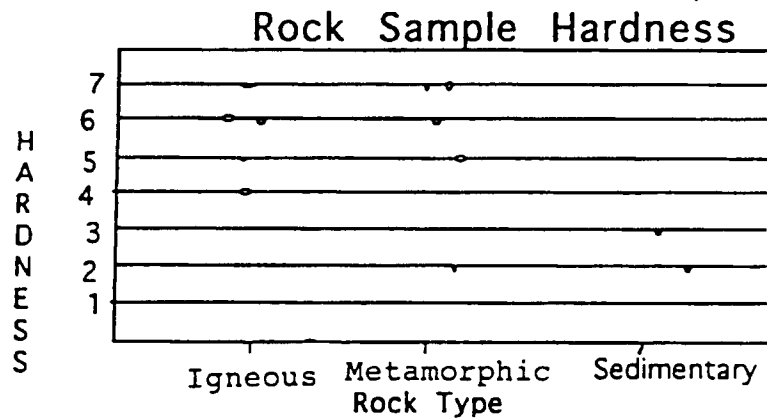
Day 2:

- Select a student to act as teacher to use Day 1 organizer to review previous work.
- Spend 5 to 10 minutes revisiting rock and mineral tests which have been previously taught.
- Pose the question "Can certain properties be directly correlated to each rock type?" Allow a few minutes for oral response.

- Students will work in pairs to test rock samples through the following tests: calcite, hardness, color, texture in order to answer the question. Test results will be recorded in science notebooks, lab books, folder (whatever is used by teacher).
- Distribute two rocks per group and test materials (vinegar, nails, pennies, glass slides). Ensure rocks are labeled with a number and with rock type.
- After testing is complete, have students check that notes are complete, they have included sample number, done all tests, etc.
- Explain that next step will be to organize class data using scatter plots and tables. Include a review of scatter plots using available math text as a resource.

Day 3:

- Start by restating the question “Can certain properties be directly correlated to each rock type?” Ask if any student can answer based on his or her data. Why or why not?
- Create class graphic display of hardness, color and texture by rock type per example shown below:



(Note: Color code plots for each rock type so that students can easily see any correlations that may exist between rock type and property)

- Create a table which tallies the number of samples with calcite and without calcite for each rock type.
- (If time allows) Have students observe and discuss (in pairs) the organized data. Ask questions like:
 - “What patterns do you see?”
 - “What do you notice?”
 - “Do you see correlations?”
 - “Can you think of reasons for what our data shows?”

Students should record observations in science notebook.

Days 4 and 5:

- Distribute six unidentified rock samples and student prompt to each group.
- Direct students to test rock samples and complete writing assignment.
- Pose question “Can certain properties be directly correlated to each rock type?” Discuss student conclusions.

Performance Assessment:

Students will write to inform using Student Resource 1 (writing prompt). The scoring rubric is Teacher Resource 1.

Extension/Follow Up:

- Using a map and encyclopedias, locate sites of mineral and rock deposits of each type. Students could use scatter plots to correlate types to continents and draw conclusions based on their organized data.
- Explore rocks and minerals to determine which are most desirable as building materials based on their properties.

Authors:

Linda Pugh
Runnymede Elementary School
Carroll County, MD

Anita O'Neill
Strawberry Knoll Elementary School
Montgomery County, MD

Writing to Inform Prompt

You have now completed testing of your unidentified rock samples. You have made notes in your notebook regarding hardness, calcite content, color, and texture. Now it is time for you to identify your rocks as igneous, metamorphic, or sedimentary, then write a letter to your teacher explaining your results.

Before you write, think about your observations and conclusions from the whole class data analysis activity. Consider the patterns and correlations you observed and how they can help explain your identification of the rock set.

Now write a letter to explain to your teacher how you identified your rock samples using the analyzed data. Your letter should include references to each property test and a reason why the data did or did not help you identify the rocks. Be sure to use proper letter format, grammar, spelling, and punctuation.

Rubric for Writing to Inform Prompt

FOUR POINTS:

- Uses correct letter format.
- Maintains topic focus.
- Uses correct grammar, spelling and punctuation.
- References all four rock property tests.
- References to whole class data are completely accurate.

THREE POINTS:

- Uses correct letter format.
- Maintains topic focus.
- Uses correct grammar, spelling and punctuation with very few mistakes.
- References three rock property tests.
- References to whole class data are mostly accurate.

TWO POINTS:

- Omitted part of letter format.
- Generally focuses on topic.
- Several mistakes observed in grammar, spelling and punctuation.
- References two rock property tests.
- References to whole class data are somewhat accurate.

ONE POINT:

- Omitted several parts of letter format.
- Little topic focus displayed.
- Several mistakes observed in grammar, spelling and punctuation.
- References one rock property test.
- References to whole class data are not accurate.

Rock Type Information

Hard As A Rock
Teacher Resource 2

Rock Type				
Igneous				
Metamorphic				
Sedimentary				